20070329.ba v04_n033.bam.20070329

>From ???@??? Wed Mar 28 21:06:16 2007 -0600
Date: Thu, 29 Mar 2007 03:04:35 GMT
From: Old Tube Radios <boatanchors@theporch.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: BOATANCHORS digest 4033
Message-Id: <20070329030436.5EF7B187A4E@srvr1.theporch.com>

BOATANCHORS Digest 4033

Topics covered in this issue include:

1) Re: Twelve (12) 6146 Amp Tubes
   by "David Stinson" <arc5@ix.netcom.com>
2) Re: BOATANCHORS digest 4032
   by Roy Morgan <roy.morgan@nist.gov>
3) Re: NC-125/240D comparison
   by "JAMES HANLON" <knjhanlon@msn.com>
4) FS: Sweet Sixteen Heavy Metal (Tubes, dat is...)
   by "David Stinson" <arc5@ix.netcom.com>
5) Missing BA digests
   by John Sehring <jsehring@siouxvalley.net>
6) Re: [Milsurplus] FS: Sweet Sixteen Heavy Metal (Tubes, dat is...)
   by "David Stinson" <arc5@ix.netcom.com>
7) Orr NC240D article
   by "JAMES HANLON" <knjhanlon@msn.com>
8) How Much Vacuum in "Vacuum Tubes?"
   by "David Stinson" <arc5@ix.netcom.com>
9) Re: How Much Vacuum in "Vacuum Tubes?"
   by "Tom Rauch" <w8ji@contesting.com>
10) Re: How Much Vacuum in "Vacuum Tubes?"
   by Jack Harper <jharper@bsi2000.com>
11) Re: How Much Vacuum in "Vacuum Tubes?"
   by Scott Robinson <spr@earthlink.net>
12) Re: How Much Vacuum in "Vacuum Tubes?"
   by "Arden Allen" <gumbear@pacbell.net>
13) 6L6/815 50 watt transmetter
   by Niel Wiegand <nielwiegand@aggienetwork.com>
14) Re: How Much Vacuum in "Vacuum Tubes?"
   by Gary Anderson <w8ivf@frontiernet.net>
15) Re: How Much Vacuum in "Vacuum Tubes?"
   by Jack Harper <jharper@bsi2000.com>
16) Re: How Much Vacuum in "Vacuum Tubes?"
   by Gary Anderson <w8ivf@frontiernet.net>
17) Re: How Much Vacuum in "Vacuum Tubes?"
   by guillaume gagnon dugas <collins2@globetrotter.net>

Message-ID: <001101c76fe2$d5095880$fa01fea9@Default>
From: "David Stinson" <arc5@ix.netcom.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Twelve (12) 6146 Amp Tubes
Date: Mon, 26 Mar 2007 14:10:39 -0600
MIME-Version: 1.0
Content-Type: text/plain;
     charset="Windows-1252"
Content-Transfer-Encoding: 7bit

6146s are sold. Thanks, everyone.

Message-Id: <6.0.0.22.2.20070326150909.04798908@mailserver.nist.gov>
Date: Mon, 26 Mar 2007 15:10:18 -0400
To: Old Tube Radios <boatanchors@theporch.com>
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: BOATANCHORS digest 4032
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"; format=flowed

At 02:48 PM 3/26/2007, you wrote:
>Subject: Need Manual for Morrow CM-1
>
>I looked at all the manual vendors I have in my database plus BAMA without
>success. The CM-1 was been modified with a small box on the rear that has a
>toggle switch. Further it has a red neon indicator on the front.

David,

$urplu$$ $ale$ of Nebra$ka has them:
http://www.surplussales.com/Manuals/man_morrow.html

$11.00

Roy

- Roy Morgan, K1LKY since 1959 - Keep 'em Glowing
13033 Downey Mill Road, Lovettsville, VA 20180
Phone 540-822-5911   Cell 301-928-7794
Work: Voice: 301-975-3254, Fax: 301-975-6097
roy.morgan@nist.gov --

Message-ID: <BAY110-DAV136AE819FD259070B65AEDA06F0@phx.gbl>

```
From: "JAMES HANLON" <knjhanlon@msn.com>
To: Old Tube Radios <boatanchors@theporch.com>
Cc: "Old Tube Radios" <boatanchors@theporch.com>
Subject: Re: NC-125/240D comparison
Date: Mon, 26 Mar 2007 13:51:27 -0600
MIME-Version: 1.0
Content-Type: multipart/alternative;
     boundary="----=_NextPart_000_0111_01C76FAD.D9A764C0"

This is a multi-part message in MIME format.

------=_NextPart_000_0111_01C76FAD.D9A764C0
Content-Type: text/plain;
     charset="iso-8859-1"
Content-Transfer-Encoding: quoted-printable

John and Rodger,

I have three, National sliding-coil receivers in my collection, an =
NC-101X that I restored from a "hack job," an NC-200 which is the =
pre-war version of the NC-240D, and an NC-80X.  I agree with Rodger that =
you should not expect problems with the sliding-coil mechanism.  It =
usually is not necessary to actually remove the sliding-coil assembly in =
order to service one of these radios.  All of the bottom wiring is =
accessible by sliding the coil catacomb to either one end or the other =
of the chassis.  The cover of the catacomb can be removed in case you =
have to get to any of the individual coil assemblies.  I did have to =
remove the catacomb to restore my NC-101X, and I managed to get it out =
and back in successfully.  It was a very interesting operation, however! =
 =20

I did have a frequency instability problem with the NC-200 when I first =
acquired it twenty years ago.  It was bouncy on all bands, so I started =
looking for one capacitor that would cause the local oscillator to =
bounce.  It turned out that it was all of the pink, ceramic variable =
trimmer capacitors used to adjust the local oscillator, on the high end =
of the frequency ranges as I recall.  All of the caps were bouncing open =
and closed.  When I replaced them the receiver became quite stable. =20

I don't have an NC-125, but I do have a Select-O-Ject that I use =
occasionally with my HRO-50.  I would far prefer to have the crystal =
filter in the NC-240D rather than the SOJ in the NC-125. =20

The NC-125 should have a lower noise front end than the NC-240D.  I =
should be able to turn up that Bill Orr article for you if you decide to =
get the "240" and you want to see what mods Bill made to improve the =
front end.  It is in CQ magazine, November 1957.  Bill replaced the RF =
amplifier tube with a 6SG7, the mixer with a 6SB7-Y, and he added a =
VR-150 to regulate B+ for the local oscillator and the BFO. =20

73,

Jim Hanlon, W8KGI
------=_NextPart_000_0111_01C76FAD.D9A764C0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*         ---REMAINDER OF MESSAGE TRUNCATED---             *
*     This post contains a forbidden message format        *
*  (such as an attached file, a v-card, HTML formatting)  *
*    Mail Lists at theporch.com only accept PLAIN TEXT     *
* If your postings display this message your mail program *
* is not set to send PLAIN TEXT ONLY and needs adjusting  *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

------=_NextPart_000_0111_01C76FAD.D9A764C0--

------------------------------
Message-ID: <007101c77003$755b9ee0$fa01fea9@Default>
From: "David Stinson" <arc5@ix.netcom.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: FS: Sweet Sixteen Heavy Metal (Tubes, dat is...)
Date: Mon, 26 Mar 2007 18:04:09 -0600
MIME-Version: 1.0
Content-Type: text/plain;
     charset="Windows-1252"
Content-Transfer-Encoding: 7bit

Ever want to play with 16xx series tubes?

(7)  1619
(2)  1631
(2)  1622
(2)  1649
(5)  1613
plus 1611, 1632, and 1634

Twenty One tubes, tested good on my TV-7.

            $23 shipped anywhere in the U.S.,
              write for elsewhere.
              I take PayPal.
Thanks!  David S.

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```

```
Content-Disposition: inline
Content-Transfer-Encoding: binary
Mime-Version: 1.0
From: John Sehring <jsehring@siouxvalley.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Missing BA digests
Content-Type: text/plain
Message-Id: <20070326234722.CB71F2ED5DD@filter6.e-filtering.net>
Date: Mon, 26 Mar 2007 17:47:22 -0600 (MDT)

Anybody beside me miss BA digests# 4029, 4030, 4031?

 --John Sehring  WB0EQ/VE6




------------------------------
Message-ID: <001301c7700b$6c94f100$fa01fea9@Default>
From: "David Stinson" <arc5@ix.netcom.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: [Milsurplus] FS: Sweet Sixteen Heavy Metal (Tubes, dat is...)
Date: Mon, 26 Mar 2007 19:01:15 -0600
MIME-Version: 1.0
Content-Type: text/plain;
     charset="Windows-1252"
Content-Transfer-Encoding: 7bit

Tubes sold.  Thanks again.

------------------------------
Message-ID: <BAY110-DAV5E2194208F50230326D31A06E0@phx.gbl>
From: "JAMES HANLON" <knjhanlon@msn.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Orr NC240D article
Date: Mon, 26 Mar 2007 22:37:29 -0600
MIME-Version: 1.0
Content-Type: multipart/alternative;
     boundary="----=_NextPart_000_014B_01C76FF7.560657D0"

This is a multi-part message in MIME format.

------=_NextPart_000_014B_01C76FF7.560657D0
Content-Type: text/plain;
     charset="iso-8859-1"
Content-Transfer-Encoding: quoted-printable

Guys,
I found the November '57 CQ with Bill Orr's article on "New Life for the =
National NC-240D."  Let me know if you want a scanned copy.

Jim, W8KGI
------=_NextPart_000_014B_01C76FF7.560657D0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*          ---REMAINDER OF MESSAGE TRUNCATED---            *
*      This post contains a forbidden message format       *
*  (such as an attached file, a v-card, HTML formatting)  *
*     Mail Lists at theporch.com only accept PLAIN TEXT    *
* If your postings display this message your mail program *
* is not set to send PLAIN TEXT ONLY and needs adjusting  *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

------=_NextPart_000_014B_01C76FF7.560657D0--

------------------------------
Message-ID: <000e01c7716b$78d65420$fa01fea9@Default>
From: "David Stinson" <arc5@ix.netcom.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: How Much Vacuum in "Vacuum Tubes?"
Date: Wed, 28 Mar 2007 13:01:18 -0600
MIME-Version: 1.0
Content-Type: text/plain;
     charset="Windows-1252"
Content-Transfer-Encoding: 7bit

"Vacuum" is a relative term.
Just how much "vacuum" does one need to make a vacuum tube work?
Our valves can't be at perfect vacuum; no way that thin glass
would hold up.  So is it possible for an amatuer to create a
vacuum pump and chamber good enough for tubes?
Kinda thinking about how to recover rare or expensive
tubes that have gone gassy or low-em.
I have engraved-base, big-globe types 80 and 50
that would look soooo good in a classic '20s homebrew,
if only.....

------------------------------
Message-ID: <00be01c77165$1c7e8e00$640fa8c0@radioroom>
From: "Tom Rauch" <w8ji@contesting.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: How Much Vacuum in "Vacuum Tubes?"
Date: Wed, 28 Mar 2007 14:15:39 -0400
MIME-Version: 1.0
```

Content-Type: text/plain;
     format=flowed;
     charset="Windows-1252";
     reply-type=original
Content-Transfer-Encoding: 7bit

> Just how much "vacuum" does one need to make a vacuum tube
> work?

Virtually perfect. The slightest amount of gas creates big problems in vacuum tubes.

> Our valves can't be at perfect vacuum; no way that thin
> glass
> would hold up.

Way.

With a perfect vacuum the pressure differential is only 14.7 pounds per square inch at sea level. Very thin glass can easily handle that.

>So is it possible for an amatuer to create a
> vacuum pump and chamber good enough for tubes?

No. The seal has to be opened, the tube has to be heated very hot, and then it has to be pumped. Sometimes the final pump is a gettering material that is flashed at very high temperatires. It would require a furnace and getting inside the tube, and any exposure to air would have ruined materials inside the tube.

What can sometimes be done is to start a controlled arc inside the tube. An arc will sometimes getter the tube if the gas isn't real bad. I've degassed vacuum caps and some power grid tubes that way.

73 Tom

Date: Wed, 28 Mar 2007 13:02:59 -0600
To: Old Tube Radios <boatanchors@theporch.com>
From: Jack Harper <jharper@bsi2000.com>
Subject: Re: How Much Vacuum in "Vacuum Tubes?"
Mime-Version: 1.0
Content-Type: text/plain; charset="iso-8859-1"; format=flowed
Content-Transfer-Encoding: quoted-printable
Message-Id: <20070328190311.54DDF187A48@srvr1.theporch.com>

At 12:15 PM 3/28/2007, you wrote:
>>Just how much "vacuum" does one need to make a vacuum tube work?

Back in 1996, there was a fairly long thread on=20
"Homebrew Vacuum Tubes" that started with the=20
following from W4AOS@aol.com: The resulting=20
thread went on for some time -- off and on into 1999 :)

Regards to the List -
Jack, W=D8YJ (Friend to all Things Hammarlund):

=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D=
=3D=3D=3D=3D=3D=3D=3D=3D=3D=3D

(from W4AOS in 1996):

While reading some old QST's I came across the following in QST for June
1945. I thought it might be interesting to some of you who have been
discussing homebrew tubes. It does not contain any really useful=
 information
for those wanting to make tubes, but shows that it can be done.

---=
--

 >From June 1945 QST pages 58&84

REPORT ON AMATEUR TUBE MAKING
3035 East Van Buren, Phoenix Ariz.
Editor QST:
      I noticed in the January, 1945, issue of QST that T/Sgt. Warren H.
Donnelly asks about glass blowing, vacuum pumps and tube parts. I wondered
if there are others interested enough to know about and use these things.
      I made my first tube nearly twenty years ago and have made many
electronic devices since and always as an amateur. The great mystery of the
vacuum tube is not hard to unravel. The hardest part is finding the
necessary information and the patience to learn glass working. Glass=
 blowing
is a matter of practice. Vacuum technique is a matter of catching all the
little things. Tube parts usually can be made from materials found in the
home, with the exception of glass tubing and filaments or cathodes.
  Oxide-coated heaters and filaments are not too difficult. You can make
metal tubes easily in some cases. "Getters" are easy to use when you once
know how. A small one-piece motor, vacuum pump, and blower (or air pressure
pump) can be built. This is used for air for a homemade glass-blowing torch
and a vacuum pump for the rough vacuum. The high vacuum is produced by a
diffusion-, or condensation-pump, and is made entirely of glass. Tools such

as small jigs, a small spot-welder, torches, etc., all are easy to make.

It costs less to buy a finished tube, but one can not always find just that special tube, and glass blowing and tube making are lots of fun for those who like to learn and build such things. For those who are very serious about the scientific angle or who for other reasons of their own desire to be able to build tubes of various kinds -- it can be done at home.

C. N. Lowenstein W6TEG

--=
--

Mime-Version: 1.0
Message-Id: <p06240803c23070f3dbbf@[192.168.1.2]>
Date: Wed, 28 Mar 2007 12:24:59 -0700
To: Old Tube Radios <boatanchors@theporch.com>
From: Scott Robinson <spr@earthlink.net>
Subject: Re: How Much Vacuum in "Vacuum Tubes?"
Content-Type: text/plain; charset="us-ascii" ; format="flowed"

David,

"Fraid you're wrong. The vacuum is pretty good--10^^- many atmospheres--good enough that the glass is carrying the full 15 psi in any case.

Glass is stronger than you think, and round is a strong shape, too.

Regards,

Scott

>"Vacuum" is a relative term.
>Just how much "vacuum" does one need to make a vacuum tube work?
>Our valves can't be at perfect vacuum; no way that thin glass
>would hold up. So is it possible for an amatuer to create a
>vacuum pump and chamber good enough for tubes?
>Kinda thinking about how to recover rare or expensive
>tubes that have gone gassy or low-em.
>I have engraved-base, big-globe types 80 and 50
>that would look soooo good in a classic '20s homebrew,
>if only.....

Message-ID: <001401c7717e$a9073bb0$93e47443@KB6NAX>
From: "Arden Allen" <gumbear@pacbell.net>
To: Old Tube Radios <boatanchors@theporch.com>

Subject: Re: How Much Vacuum in "Vacuum Tubes?"
Date: Wed, 28 Mar 2007 14:18:34 -0700
MIME-Version: 1.0
Content-Type: text/plain;
     charset="Windows-1252"
Content-Transfer-Encoding: 7bit

I'm not an expert on this but the rebuilding of high power tubes is still a standard process. Here's a link: http://www.theinquirer.net/default.aspx?article=35537. Smaller tubes aren't worth rebuilding as a commercial enterprise. Remember when you could buy a TV picture tube rebuilding setup for the corner TV shop to make some extra dough? I think what you would get to rebuild a tube was a new electron gun and aquadag for sprucing up the coating inside the envelope. A torch, vacuum pump and other tools were required. But that's all I remember about it. A high school buddy of mine ran a repair shop and rebuilt tubes for a while until one imploded on him and even though he was wearing protective gear he still managed to absorb some glass fragments. Here's a link: http://www.hawkeyepicturetube.com/antiquetvtubes.html.

My guess would be you would have to install the tube essentials in a new clean envelope with a new getter, pump down the tube while using an induction coil to heat the tube to the required temperature for the required amount of time and then flash the getter. The purpose of this process is to boil trapped gases out of the tube elements and retrap them on the inside surface of the envelope. I would suppose a used oil diffusion pump that would get you a decent vacuum could be had for a couple of thou on ePuddle. The induction coil probably requires a kilowatt or so in the hundreds of kHz to few MHz region. I'm just guessing.

Mostly beyond my ken, the getter works by chemically compounding with the residual gases in the tube. The getter is a metalic pellet that "flashes" when raised to the temperature where it suddenly boils off taking gas molecules with it to the envelope wall. The getter appears mirror like because only a small percentage of the metal combines with a gas. If a tube loses its vacuum the getter turns white as the metal becomes oxidized. I found this site informative: http://www.vacuumtubes.net/How_Vacuum_Tubes_Work.htm.

For those of your tubes that still have good filaments rejuvenation may work to restore their operation to a useful value. Here's a link: http://www.antiquewireless.org/otb/rejuve.htm

Arden Allen
KB6NAX

Message-ID: <460AEF9C.1080708@aggienetwork.com>

Date: Wed, 28 Mar 2007 17:43:40 -0500
From: Niel Wiegand <nielwiegand@aggienetwork.com>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
CC: Niel Wiegand <nielwiegand@aggienetwork.com>
Subject: 6L6/815 50 watt transmetter
Content-Type: text/plain; charset=us-ascii; format=flowed
Content-Transfer-Encoding: 7bit

I've always been interested in the 815 based 50 watt transmetter that showed up in QST and the ARRL handbooks just before WWII. Has anyone built one?

I'm posting my thoughts/progress as I build one on my blog at http://w0vlz.blogspot.com/

73,
Niel - W0VLZ
http://www.io.com/~nielw/wa5vlz.htm

Message-ID: <460AFCDA.3040401@frontiernet.net>
Date: Wed, 28 Mar 2007 19:40:10 -0400
From: Gary Anderson <w8ivf@frontiernet.net>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: How Much Vacuum in "Vacuum Tubes?"
Content-Type: text/plain; charset=ISO-8859-1; format=flowed
Content-Transfer-Encoding: 7bit

I've never rebuilt a tube, but I have thought about it :-)

According to "Fundamentals of Vacuum Tubes" by Eastman (1941), a pressure of 10 (-5) mm Hg or torr should be sufficient. (760 mm Hg = 1 atmosphere) They do not give a "minimum" required vacuum for a tube to work, but instead calculate the "mean free path" of an electron and give an example that would indicate an electron would cover 12700 cm in a vacuum of 7 x 10 (-5) mm Hg before it would collide with an atom of gas. I don't think his argument is good enough. But it is the one reference I have that gives a "simple" answer to your question.

First, I think you would have to avoid "corona discharge". This can occur at pressures as low as 10 (-1) to 10 (-2) torr. Spacecraft had failures during launch back in the days when they used HV power supplies (re: the Ranger 6 camera....a connector arc'ed over during launch, turned the HV supply on, and destroyed the camera). They learned that they had to ensure the power supplies stayed off until they reached orbit (a pressure of 10 (-14) torr or so). Evacuating tubes would be easy in low earth orbit! (a project for the ISS?) I suspect this would set the absolute lower limit at 10 (-3) torr or so. (calculating the corona discharge region with any precision is a real mess........you have to take into account the architecture of the wires, the voltage, pressure, even the surface roughness of the materials that would be arcing)

I have to create high vacuums at work, so I have some experience there. Most of the pumps I have seen sold surplus are oil-type pumps. They cannot pump reliably below about 10 (-3) torr or so at best. That, in conjunction with NEW getter material, might get you there.....but you would use much of the capability of the getter material just to create sufficient vacuum. The getter material is there to maintain the vacuum.

The glass is solid enough to handle the pressures. But all materials leak, either through the material itself or through the metal-to-glass seals. The getter material is meant to absorb the molecules that get through the envelope or the seals.

Turbine pumps will go to 10 (-6) to 10 (-7) torr. But you have to "rough pump" with an oil pump to 10 (-3) torr or so before you can apply the turbine pump.....a turbine pump will not do the job alone. (there are some new pumps that are "compound" pumps that will do both.....but they are very expensive and have very low capacity. Then again, turbine pumps alone are expensive (> $15K new).

At work, we try to heat an assembly while pumping, but we do it with internal heaters (resistors attached to an object in vacuum with a power supply attached to create heat) and/or by adding external heating pads. The mechanism is simple: atoms/molecules are liberated from hot objects and stick to cold objects. Heat the assembly as much as possible so that as many molecules as possible float around inside the enclosure and can be sucked out by the pump.

The hard part is the getter.......how do you replenish it? If you install and flash a new getter, you have to remove the old getter material. How? That I do not know.

As one or the guys mentioned, a HV arc can "pump" the envelope. We use a variation of that called a Vac-Ion pump. Apply a HV (say 2 kV) across two plates inside a vacuum and drive the molecules into the plate. As a bonus, the current drawn from the HV supply is proportional to the vacuum....so you can measure the vacuum with one. Unfortunately, they do not have much capacity.....you can maintain a vacuum with one.....but you have to use an external pump to create the vacuum in the first place.

Another long-winded answer...........

Gary W8IVF

```
------------------------------
Date: Wed, 28 Mar 2007 17:53:29 -0600
To: Old Tube Radios <boatanchors@theporch.com>
From: Jack Harper <jharper@bsi2000.com>
Subject: Re: How Much Vacuum in "Vacuum Tubes?"
Mime-Version: 1.0
Content-Type: text/plain; charset="iso-8859-1"; format=flowed
Content-Transfer-Encoding: quoted-printable
Message-Id: <20070328235335.20625187A48@srvr1.theporch.com>
```

At 05:40 PM 3/28/2007, Gary sprechenzied:

>I've never rebuilt a tube, but I have thought about it :-)

<snip>

>I have to create high vacuums at work, so I have some experience there.

<snip>

Gary, I am curious -- Do people still use=20
"mercury diffusion pumps" these days (considering=20
the hysteria about mercury)???

My old copy of "The Amateur Scientist" (Published=20
by Scientific American in the 60's) tells, in=20
fact, how to build such a pump in the interesting=20
article "A Homemade Atom Smasher" :)   (we=20
certainly all grew up in different times than=20
today's poor unfortunate youths didn't we...).

Regards,

Jack, W=D8YJ (Friend to all things Hammarlund)
Evergreen, Colorado USA

Message-ID: <460B0E8D.6070400@frontiernet.net>
Date: Wed, 28 Mar 2007 20:55:41 -0400
From: Gary Anderson <w8ivf@frontiernet.net>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: How Much Vacuum in "Vacuum Tubes?"
Content-Type: text/plain; charset=ISO-8859-1; format=flowed
Content-Transfer-Encoding: 7bit

Jack Harper wrote:
>
> Gary, I am curious -- Do people still use "mercury diffusion pumps"
> these days (considering the hysteria about mercury)???
>
> My old copy of "The Amateur Scientist" (Published by Scientific
> American in the 60's) tells, in fact, how to build such a pump in the
> interesting article "A Homemade Atom Smasher" :)   (we certainly all
> grew up in different times than today's poor unfortunate youths didn't
> we...).

Jack,

Like you, I have read about them, but I have never used one....or heard of anyone else using them.....at least recently.

I'd love to see one, though.

Gary W8IVF

Date: Wed, 28 Mar 2007 23:03:26 -0500
From: guillaume gagnon dugas <collins2@globetrotter.net>
Subject: Re: How Much Vacuum in "Vacuum Tubes?"
To: Old Tube Radios <boatanchors@theporch.com>
Message-id: <004701c771b7$34a1eed0$6500a8c0@qg529741f1d16a>
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a few weeks ago a gentleman on this group asked about an article in an issue of qst 1937 about push-push. i found it . i lost the email address of that ham. the article wasn't in qst but in 1937 radio magazine. if you still want me to scan that article pease contact me directly.   luc ve2lgj 73s
----- Original Message -----
From: "Gary Anderson" <w8ivf@frontiernet.net>
To: "Old Tube Radios" <boatanchors@theporch.com>

Sent: Wednesday, March 28, 2007 6:40 PM
Subject: Re: How Much Vacuum in "Vacuum Tubes?"

> I've never rebuilt a tube, but I have thought about it :-)
>
> According to "Fundamentals of Vacuum Tubes" by Eastman (1941), a pressure of 10 (-5) mm Hg or torr should be sufficient. (760 mm Hg = 1 atmosphere) They do not give a "minimum" required vacuum for a tube to work, but instead calculate the "mean free path" of an electron and give an example that would indicate an electron would cover 12700 cm in a vacuum of 7 x 10 (-5) mm Hg before it would collide with an atom of gas. I don't think his argument is good enough. But it is the one reference I have that gives a "simple" answer to your question.
>
> First, I think you would have to avoid "corona discharge". This can occur at pressures as low as 10 (-1) to 10 (-2) torr. Spacecraft had failures during launch back in the days when they used HV power supplies (re: the Ranger 6 camera....a connector arc'ed over during launch, turned the HV supply on, and destroyed the camera). They learned that they had to ensure the power supplies stayed off until they reached orbit (a pressure of 10 (-14) torr or so). Evacuating tubes would be easy in low earth orbit! (a project for the ISS?) I suspect this would set the absolute lower limit at 10 (-3) torr or so. (calculating the corona discharge region with any precision is a real mess........you have to take into account the architecture of the wires, the voltage, pressure, even the surface roughness of the materials that would be arcing)
>
> I have to create high vacuums at work, so I have some experience there. Most of the pumps I have seen sold surplus are oil-type pumps. They cannot pump reliably below about 10 (-3) torr or so at best. That, in conjunction with NEW getter material, might get you there.....but you would use much of the capability of the getter material just to create sufficient vacuum. The getter material is there to maintain the vacuum. The glass is solid enough to handle the pressures. But all materials leak, either through the material itself or through the metal-to-glass seals. The getter material is meant to absorb the molecules that get through the envelope or the seals.
>
> Turbine pumps will go to 10 (-6) to 10 (-7) torr. But you have to "rough pump" with an oil pump to 10 (-3) torr or so before you can apply the turbine pump.....a turbine pump will not do the job alone. (there are some new pumps that are "compound" pumps that will do both.....but they are very expensive and have very low capacity. Then again, turbine pumps alone are expensive (> $15K new).
>
> At work, we try to heat an assembly while pumping, but we do it with internal heaters (resistors attached to an object in vacuum with a power

> supply attached to create heat) and/or by adding external heating pads. The mechanism is simple: atoms/molecules are liberated from hot objects and stick to cold objects. Heat the assembly as much as possible so that as many molecules as possible float around inside the enclosure and can be sucked out by the pump.
>
> The hard part is the getter.......how do you replenish it? If you install and flash a new getter, you have to remove the old getter material. How? That I do not know.
>
> As one or the guys mentioned, a HV arc can "pump" the envelope. We use a variation of that called a Vac-Ion pump. Apply a HV (say 2 kV) across two plates inside a vacuum and drive the molecules into the plate. As a bonus, the current drawn from the HV supply is proportional to the vacuum....so you can measure the vacuum with one.   Unfortunately, they do not have much capacity.....you can maintain a vacuum with one.....but you have to use an external pump to create the vacuum in the first place.
>
> Another long-winded answer............
>
> Gary W8IVF
>
> --
> No virus found in this incoming message.
> Checked by AVG Free Edition.
> Version: 7.5.446 / Virus Database: 268.18.18/733 - Release Date:
> 2007-03-25 11:07

End of BOATANCHORS Digest 4033
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